# BASIN HIGHLIGHTS REPORT
# of the Canadian River Basin

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Red River Authority of Texas
would like to acknowledge the assistance and expertise received from the
Canadian River Municipal Water Authority
in preparing this Basin Highlights Report


Additional information and details of the screening analysis results are available on the Authority's website at www.rra.dst.tx.us/Publications/CRP or a copy of the Basin Highlights Report can be obtained by contacting the office at (940) 723-0855.

*All parameters screened utilized the State's Surface Water Quality Monitoring Standards, and, as such, do not reflect drinking water standards.*

# BASIN HIGHLIGHTS REPORT
# of the Canadian River Basin

Draft: April 2001

## 1. INTRODUCTION

Drought has continued to pose a threat to all of the natural resources within the Canadian River Basin, especially the water supplies throughout the region. Since its inception more than ten years ago the Clean Rivers Program has successfully embedded the goals of the Clean Rivers Act, as envisioned by the 71st Legislature, into the environmental community. As springtime renews the promise of showers, the region anxiously awaits the possibility of emerging from yet another dry year, and the Clean Rivers Program continues to triumph over this adversity and persevere toward meeting its goals.

The Canadian River Basin encompasses the majority of 15 counties in the Texas Panhandle. With its beginnings in northeastern New Mexico, the Canadian River crosses the Panhandle covering a drainage area of 12,616 square miles, eventually flowing into the Mississippi River. Contrasting elevations from 9,000 feet to 2,870 feet and average rainfall amounts of 15 to 25 inches shape this distinctive area. The basin contains three major reservoirs and four aquifers, including the Ogallala, that provide water uses to more than half of a million people who live and work in the Canadian River Basin of Texas.

## 2. CLEAN RIVERS PROGRAM GOALS

In an effort to facilitate improved planning, monitoring, geographical analysis and dissemination of information, the Canadian River Basin was divided into five sub-basins or reaches, then further divided into subwatersheds. The following goals are targeted to comprehensively assess the basin and implement positive procedures to conserve, reclaim and protect the water resources of the Canadian River Basin:

### 2.1 Identify Water Quality Conditions

Selected water quality monitoring sites have been designated for collection of chemical, physical and biological data. Collected samples are analyzed in the field, at the Authority's Environmental Laboratory or at a contract laboratory. Within days of collection, the results of the analyses are entered into the data repository, which currently contains more than ten years of quality-assured water resource information of the basin. The data, obtained from 34 monitoring stations, are then screened utilizing methodologies and criteria approved by the Texas Natural Resource Conservation Commission (TNRCC). Data entered into the database are immediately available for use by the public via the Authority's website at www.rra.dst.tx.us/CRP, and assist local communities who are facing stricter permitting requirements to make informed decisions about their water resource management practices, based on good science.

High concentrations of salt in the upper reaches of the Canadian River continue to be a concern because of its effect on Lake Meredith as a potable water supply. The Lake Meredith Salinity Control Project has determined that a major contributor of saline water to the river system is a shallow brine aquifer under artesian pressure that filters into the river channel. Approximately 70% of the chlorides in Lake Meredith originate at this location downstream of the Ute Dam near Logan, New Mexico. Deep well injection of the highly saline water is considered to be the most effective solution to this problem, however, since the salt is stored in the river channel sand, it will continue to leach into the river for an indefinite amount of time. Nutrient concentrations continue to support undesirable growths of algae or aquatic vegetation that produce adverse impacts on water uses in Rita Blanca Lake due to naturally occurring phenomena.

## 2.2 Identified Regional Concerns

The Panhandle area of Texas has suffered the consequences of drought during the last few years just as other areas of the state have. However, the people of this area are accustomed to weather adversities and are aggressively confronting the problems caused by the drought. Surface water demands are currently being met by Lake Meredith, located north of Amarillo in Potter, Moore and Hutchinson Counties. Palo Duro Lake, dedicated in 1991 and located near Spearman in Hansford County, has not captured a sufficient amount of water to be a viable water supply yet. The low lake level has caused depressed dissolved oxygen to occur, which placed the lake on the Clean Water Act (CWA) §303(d) list. Future plans for Lake Palo Duro include conveying its water to Hansford, Hutchinson and Moore Counties. The Panhandle of Texas is also blessed with a generous supply of groundwater, the largest being the Ogallala Aquifer. However, eleven area towns and approximately 25 water user groups are projecting water demands to be higher than supplies within the next 50 years.

East Amarillo Creek - September 2000

The Canadian River Municipal Water Authority (CRMWA) provides water to eleven cities in the Panhandle and South Plains via an aqueduct system from Lake Meredith. Because of the chloride content of the lake, the CRMWA is developing the Conjunctive Use Groundwater Supply Project which utilizes groundwater wells from the Ogallala Aquifer located in Roberts and Hutchinson Counties to blend with water from Lake Meredith, which will significantly reduce the chloride level, as well as the salty taste, corrosiveness and mineral deposition of the water.

Agriculture is a vital part of the Panhandle's economy, reaping a lion's share of the state's $14 billion business. Unfortunately, agriculture is particularly susceptible to drought and has recently lost millions of dollars in irrigated agriculture and livestock production. As the largest user of groundwater in Texas, agriculture faces serious challenges in the future as it wrestles with competing users, scarce supplies and rising costs. Water needed for irrigated agriculture and livestock currently requires approximately 1.75 million acre feet per year, while industry and municipal demands total less than 0.1 million acre feet per year. Likewise, the small, rural communities in the Panhandle that support agriculture are facing problems with insufficient infrastructure, funding and a declining tax base.

Focusing on these concerns has motivated the citizens to set goals in order to deter some of these future problems. The major concerns and goals include: the need for more water data, groundwater availability information, additional conservation measures, increased public participation and awareness, growing concerns about exporting groundwater out of the region, evaluating the reuse of wastewater effluent for municipal, industrial and agricultural uses, using playa lakes for recharge and other beneficial uses, creating groundwater conservation districts, and at least 50% of the current groundwater supplies remaining in 50 years. Accordingly the major obstacle to attaining these goals is funding.

## 2.3 Finding Feasible Solutions

Feasible solutions will only be identified through continual strategic water quality monitoring, analysis and planning. Water quality data collected in the Canadian Basin utilize stringent quality assured protocols to provide vital information necessary for the development of appropriate water quality standards, the preparation of an inventory of water quality, development of a list of impaired water bodies and to scrutinize wastewater discharge permits for the establishment of Total Maximum Daily Loads (TMDL) within classified stream segments.

East Amarillo Creek - November 2000

A couple of years ago the Authority initiated annual coordinated monitoring meetings with all monitoring entities within the basin. The coordinated monitoring meeting for 2001 was held on March 29, 2001 in Wichita Falls. These coordinated meetings ensure coverage of the entire basin, avoid duplication of effort and allow the monitoring partners to share information.

The coordinated collection, analysis and management of water quality data provide vital scientific solutions for maintaining the availability and quality of natural resources for all intended uses. Red River Authority of Texas, Canadian River Municipal Water Authority (CRMWA), and the United States Geological Survey (USGS) unitedly conduct water quality monitoring at key stations under the TNRCC approved Quality Assurance Project Plan (QAPP). The Texas Natural Resource Conservation Commission (TNRCC) Regional Offices also conduct water quality monitoring in the basin using the same protocols. Representatives of all of these monitoring groups attended the meeting.

Since the Canadian River Basin is a part of Group A in the five-year planning cycle, the focus for FY 2001 is continued strategy development and implementation. Strategy development and/or a preliminary basin action summary outlines the steps necessary to reduce pollutant loads in a certain body of water to restore and maintain human uses or aquatic life support. The development of TMDLs and watershed action plans is considered to be the best method to improve water quality. A TMDL is the maximum amount of a pollutant that a lake, river or stream can receive without seriously harming its beneficial uses.

TMDLs are designed for impaired water bodies contained in the CWA's draft §303(d) list for 2000. The three water bodies in the Canadian River Basin currently included on the §303(d) list are Dixon Creek, Rita Blanca Lake and Palo Duro Reservoir. Although these listings indicate a *low priority*, strategies necessary to improve their rating are significant components of the coordinated monitoring plan. TMDL development for water bodies on the §303(d) list for this basin are scheduled for FY 2002.

The Lake Meredith Salinity Control Project continues to be one of the most important pollution control programs in the basin. With the addition of Lake Meredith (segments 0102 and 0103) on the Clean Water Act's §303(d) list, some believe additional funding may become available to enhance the removal of total dissolved solids from the Canadian River and Lake Meredith, thus improving its designated uses.

Although the Clean Rivers Program has not embraced the challenges relating to groundwater quality and quantity, its importance is quite obvious since it is the major source of water supplies in the Panhandle. Groundwater availability modeling (GAM) of all of the aquifers in the Panhandle should be addressed in future water planning programs and initiated as soon as possible.

## PRIORITY WATERSHED SUMMARY
## TABLE 1

| Reach | Segment Location | Impaired Use | Cause | Source | Action Taken | Recommended Action | Rank | Funding Source | Active Participants |
|---|---|---|---|---|---|---|---|---|---|
| I | 0101 | Water Quality | Chloride, Nutrients, Cadmium | Nonpoint Sources, Natural Occurrences, Removal of Riparian Vegetation, Point Sources | Monitoring by TNRCC | Continue monitoring by TNRCC for nutrients and cadmium, complete the Salinity Control Project | L | CRP TNRCC Bureau of Reclamation | TNRCC, RRA, CRMWA, Bureau of Reclamation |
| II | 0102 | Water Quality | Salts, Chromium in Sediment, Nickel in Sediment | Nonpoint Sources, Natural Occurrences | Monitoring by TNRCC and CRMWA | Continue monitoring by TNRCC and CRMWA, complete the SCP | L | TNRCC CRMWA B of C | TNRCC CRMWA B of R |
| | 0103 | Water Quality Recreation | Salts, Fecal Coliform | Nonpoint Sources, Natural Occurrences, Wastewater Treatment Plants | §303(d) Listing Monitoring by RRA | Continue monitoring by RRA, TNRCC, complete the Salinity Control Project (SCP) | L | TNRCC CRP CRMWA B of R | TNRCC CRMWA B of R |
| III | 0105 | Water Quality Aquatic Life | Salts, Nutrients, Dissolved Oxygen, pH | Point Sources, Nonpoint Sources, Natural Occurrences, Low-flow Conditions | Monitoring by TNRCC | Discontinue contact recreation for segment, push to change standards | L | TNRCC RRA | TNRCC RRA |

## CANADIAN RIVER BASIN §303(d) LIST
## TABLE 2

| Segment Number | Segment Name | Overall Priority | Parameters of Concern | Segment Summary |
|---|---|---|---|---|
| 0101A | Dixon Creek (unclassified water body near Borger in Hutchinson County) | L | Depressed Dissolved Oxygen, Pathogens | Dissolved oxygen concentrations are occasionally lower than the criterion established to assure optimum conditions for aquatic life. Bacteria levels are sometimes higher than the criterion established to assure the safety of contact recreation. |
| 0105 | Rita Blanca Lake | L | Pathogens, Total Dissolved Solids, pH | Bacteria levels sometimes exceed the criterion established to assure the safety of non contact recreation. The average concentration of total dissolved solids (TDS) exceeds the criterion established to safeguard general water quality uses. Occasionally, pH values are higher than the criterion established to safeguard general water quality uses. |
| 0199A | Palo Duro Reservoir (unclassified water body north of Spearman in Hansford County) | L | Depressed Dissolved Oxygen | Dissolved oxygen concentrations are occasionally lower than the criterion established to assure optimum conditions for aquatic life. |

### 2.3 Public Education and Involvement

A primary reason for the success of the Clean Rivers Program is its emphasis on *public participation and education*. Through this forum the people of the Canadian River Basin have been able to broaden their awareness of water quality conditions, utilize the knowledge and expertise of many, and work together to rectify identified problems. It has provided an opportunity for the regulating agencies to display a more favorable image. It has allowed the Authority, CRMWA, Palo Duro River Authority, cities, counties, industries, agriculture and the general public to meet on common ground and collectively resolve issues to secure a higher quality of life without the apprehension of earlier periods. It has given the people of the basin an opportunity to provide their experience and understanding of this area of the state to the people who *set the standards*, thereby qualifying the need for any change.

Public participation provides for effective watershed planning and management by ensuring that local concerns are accurately addressed and the people are well represented. The Authority relies upon the guidance and counsel of the Steering Committee to maintain focus on the programs that are consistent with the priorities and issues facing the local communities. Steering Committee Meetings, open to the public, were held in Amarillo and Wichita Falls, thus allowing the people to voice their concerns and learn more about the water quality and other natural resource issues within their basin. The consensus of these meetings indicated that the programs initiated and the expenditure of resources to achieve compliance with the directives of the CRP are prudent. They agreed that additional data are needed to further evaluate the basin water quality trends and to develop effective action plans for the protection of water resources. Consequently, resources were directed toward maintaining key fixed stations for the collection of baseline data.

The Authority's website contains a myriad of information easily accessible by anyone at www.rra.dst.tx.us/CRP. Educational programs for public and private schools are available from kindergarten to the high school level. Opportunities for internships with other resource agencies are available for students entering college. Additionally, presentations on several water resource subjects are available for interested entities and civic groups, all of which are sponsored by the CRP.

### 2.4 Provide Administrative and Technical Assistance to Local Entities

During its 42 year history, the Authority's mission has been one of beneficial service to the public concerning water conservation, reclamation, protection and development of water resources. The Clean Rivers Program mirrors this goal and has allowed the Authority and TNRCC to use their expertise concurrently to assist the public. Through continuous critique by stakeholders and steering committees, the assistance that the CRP provides parallels the basin's needs. Coordination of permitting and provisions for quality assured data enable both the regulator and the regulated community to work together to find reasonable solutions toward improved management practices for protecting the water resources.

The development of a common QAPP is an example of local entities working together toward a common goal - quality assured data. The central clearinghouse for current inventories of water quality, water resource and socio-economic data related geographically is rapidly becoming a dependable resource for everyone.

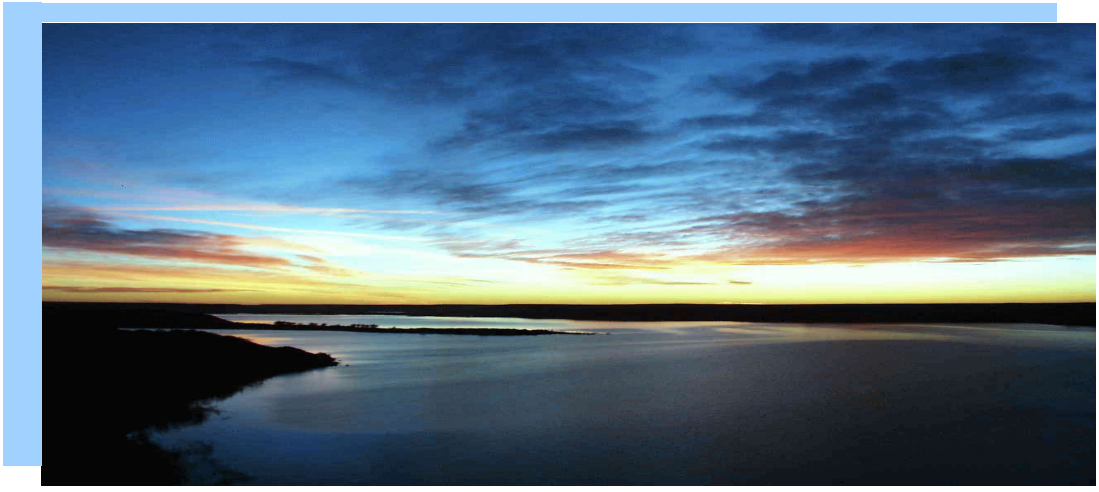
The Authority is committed to the people of the basin, as well as the goals of the Clean Rivers Program. Together we can achieve our ultimate goals, from the smallest community to the largest city.

## 3. WATER QUALITY SUMMARY OF THE FIVE REACHES

A methodical watershed approach was followed for proper identification and isolation of individual factors having an influence on the quality of the water resources obtained from large geographical areas. Therefore, each primary area of study was hydrologically divided into five basin reaches.

To adequately screen for field parameters (dissolved oxygen, pH, temperature) and conventional parameters (nutrients, chlorophyll-*a*, dissolved solids), at least nine samples are required over the most recent five year period. If ten percent of the data for a specific parameter at a station exceeded the screening criterion, that parameter was designated as requiring further evaluation. Data that exceeded the screening criterion in 25% of the total samples collected were designated as an exceedance or concern.

Quality assured data are screened against the State's Surface Water Quality Standards or an appropriate numerical value as established by the TNRCC, to determine whether instream conditions are supporting the segment's designated uses. Screening levels are intended to provide a basis for comparison and to help identify the influences of point and nonpoint sources of pollution within a watershed. Each parameter that exceeded the screening criteria was subject to further evaluation to assist in determining factors influencing the water quality. Statistical, spatial and/or trend analyses were performed and plotted on those parameters showing a concern. Each of the parameters identified as having a concern or needing further investigation are shown and discussed in the following section.



Sunset at Lake Meredith

# CANADIAN RIVER BASIN
## STATISTICAL SUMMARY OF PARAMETERS SCREENED THIS PERIOD
## TABLE 3

| Reach | Seg | Station | Description | Storet | Parameter | N | Mean | Max | Min | Std Dev | Crit | N>Crit | %>Crit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| I | 101A | 10016 | Dixon Creek near Canadian River Confluence NE of Borger | 31616 | Fecal Coliform, MF, M-FC, (#/100 ml) | 31 | 512.6 | 1,330.0 | 58.0 | 369.7 | 200 | 23 | 74% |
| | 101 | 10024 | Rock Creek at Bridge in Electric City near Borger | 31616 | Fecal Coliform, MF, M-FC, (#/100 ml) | 10 | 171.2 | 430.0 | 80.0 | 106.6 | 200 | 3 | 30% |
| | 101 | 10025 | Rock Creek at Hwy 136 downstream of Lake Weatherly, W of Borger | 31616 | Fecal Coliform, MF, M-FC, (#/100 ml) | 11 | 409.2 | 1,187.0 | 11.0 | 375.7 | 200 | 6 | 55% |
| | 101 | 10032 | Canadian River Bridge at US 60-83 at Canadian | 31616 | Fecal Coliform, MF, M-FC, (#/100 ml) | 22 | 82.6 | 700.0 | 2.0 | 154.9 | 200 | 2 | 9% |
| | 101 | 10033 | Canadian River Bridge on SH 70 N of Pampa | 31616 | Fecal Coliform, MF, M-FC, (#/100 ml) | 32 | 77.4 | 1,000.0 | 2.0 | 173.8 | 200 | 2 | 6% |
| | 101 | 10034 | Canadian River Bridge at Plemons Road, S of Plemons | 31616 | Fecal Coliform, MF, M-FC, (#/100 ml) | 19 | 184.8 | 1,080.0 | 4.0 | 308.8 | 200 | 4 | 21% |
| | 101 | 10035 | Canadian River about 1.3 miles upstream of FM 2277 Bridge | 31616 | Fecal Coliform, MF, M-FC, (#/100 ml) | 11 | 143.6 | 840.0 | 4.0 | 255.0 | 200 | 2 | 18% |
| II | 102 | 10036 | Lake Meredith near Intake Tower at Dam NW of Sanford | 00094 | Total Dissolved Solids (Conductivity) | 46 | 1,278.9 | 1,481.3 | 981.5 | 105.9 | 1,300 | 22 | 48% |
| | 102 | 10042 | Lake Meredith Mid-Lake between Plum Creek Boat Ramp and Bates Boat Ramp | 00094 | Total Dissolved Solids (Conductivity) | 37 | 1,224.5 | 1,400.1 | 616.9 | 142.3 | 1,300 | 10 | 27% |
| | 102 | 15270 | Big Blue Creek about 250 yards upstream of FM 1913, 21 miles SE Dumas | 00094 | Total Dissolved Solids (Conductivity) | 20 | 510.4 | 588.9 | 197.6 | 89.4 | 1,300 | 0 | 0% |
| | 103 | 10018 | East Amarillo Creek at US 287 N of Amarillo | 31616 | Fecal Coliform, MF, M-FC, (#/100 ml) | 21 | 372.0 | 1,120.0 | 4.0 | 424.4 | 200 | 10 | 48% |
| | 103 | 10054 | Canadian River Bridge at US 87-287 N of Amarillo | 31616 | Fecal Coliform, MF, M-FC, (#/100 ml) | 17 | 589.0 | 5,571.0 | 8.0 | 1,404.4 | 200 | 4 | 24% |

# CANADIAN RIVER BASIN
## STATISTICAL SUMMARY OF PARAMETERS SCREENED THIS PERIOD
## TABLE 3

| Reach | Seg | Station | Description | Storet | Parameter | N | Mean | Max | Min | Std Dev | Crit | N>Crit | %>Crit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 103 | 10056 | Canadian River Bridge on US 385 N of Tascosa | 31616 | Fecal Coliform, MF, M-FC, (#/100 ml) | 20 | 1,252.5 | 11,100.0 | 2.0 | 2,613.3 | 200 | 9 | 45% |
| III | 101 | 10003 | Punta De Agua Creek at FM 767 W of Channing | 31616 | Fecal Coliform, MF, M-FC, (#/100 ml) | 12 | 94.5 | 460.0 | 4.0 | 145.9 | 200 | 2 | 17% |
| | 105 | 10060 | Rita Blanca Lake near Outlet Structure at Dam, S of Dalhart | 31616 | Fecal Coliform, MF, M-FC, (#/100 ml) | 10 | 142.9 | 667.0 | -25.0 | 237.8 | 200 | 3 | 30% |
| | 105 | 10060 | Rita Blanca Lake near Outlet Structure at Dam, S of Dalhart | 00094 | Total Dissolved Solids (Conductivity) | 13 | 761.3 | 1,196.2 | 388.1 | 244.3 | 1,000 | 2 | 15% |
| | 105 | 10060 | Rita Blanca Lake near Outlet Structure at Dam, S of Dalhart | 00400 | pH | 13 | 8.6 | 9.5 | 7.7 | 0.6 | 6.5-9.0 | 4 | 31% |
| IV | 199A | 10005 | Palo Duro Reservoir at Boat Launch near Dam, 19 KM N of Spearman | 00300 | Dissolved Oxygen (mg/L) | 10 | 7.4 | 11.0 | 2.1 | 3.6 | 5.0 | 4 | 40% |
| V | 104 | 10058 | Wolf Creek Bridge at SH 305 N of Lipscomb | 00094 | Total Dissolved Solids (Conductivity) | 34 | 984.8 | 1,319.5 | 280.8 | 231.9 | 1,125.0 | 8 | 24% |
| | 104 | 10058 | Wolf Creek Bridge at SH 305 N of Lipscomb | 31616 | Fecal Coliform, MF, M-FC, (#/100 ml) | 32 | 166.9 | 580.0 | 2.0 | 162.9 | 200.0 | 10 | 31% |
| | 104 | 10059 | Wolf Creek at FM 1454, 27.4 KM E of Lipscomb | 00094 | Total Dissolved Solids (Conductivity) | 11 | 856.3 | 1,039.4 | 667.6 | 143.9 | 1,125 | 0 | 0% |
| | 104 | 10059 | Wolf Creek at FM 1454, 27.4 KM E Lipscomb | 31616 | Fecal Coliform, MF, M-FC, (#/100 ml | 11 | 106.9 | 290.0 | 2.0 | 92.3 | 200 | 1 | 9% |

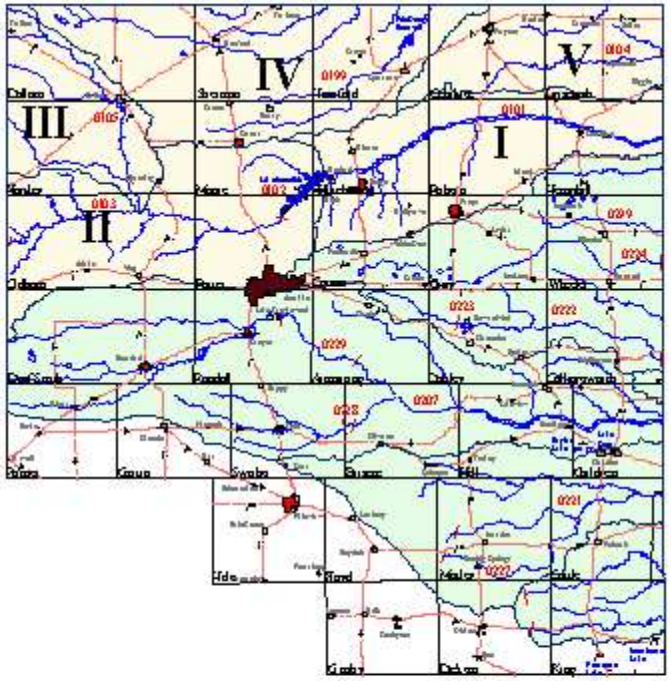
**Exceeded Screening Criteria**

**Exceeded Screening Criteria and is Listed on CWA §303(d) List**

**Listed on CWA §303(d) List, But Did Not Exceed Screening Criteria**

**N = Number of Samples**

# CANADIAN RIVER BASIN




N
W E
S

Reach Boundaries
Population
0 - 2826
2827 - 10875
10876 - 34395
34396 - 101986
101987 - 172289
Highways
Canadian River Basin Hydrology
Red River Basin Hydrology
Counties
Canadian River Basin Segments
Red River Basin Segments
Reservoirs
Canadian River Basin
Red River Basin

50 0 50 100 Miles

Vicinity Map